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STUDIES IN THE BULBOUS LILIACEAE: 1. *SCILLA, SCHIZOCARPHUS AND LEDEBOURIA*

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ABSTRACT

Cytological, anatomical and chromatographic work on the genus *Scilla* sensu lato in South Africa is reviewed. Evidence relating to the best generic grouping of these species is discussed and a key produced to the species of the two genera, *Scilla* and *Ledebouria*, recognised. Four species are recognised in *Scilla* and fifteen in *Ledebouria*. A full treatment of synonyms is given and notes on distribution and affinities of each species supplement the brief descriptions (of *Ledebouria* spp. only). Fourteen new combinations are effected and two new species, *L. luteola* and *L. viscosa*, described.

UITTREKSEL

STUDIES VAN DIE BOLDRAENDE LILIACEAE: 1. *SCILLA, SCHIZOCARPHUS* EN *LEDEBOURIA*. Sitologiese, anatomiese en kromatografiese werk aan die geslag *Scilla* sensu lato in Suid-Afrika word bespreek. Getuienis oor die beste generiese groepering van die soorte word bespreek en 'n sleutel word voorsien vir die twee geslagte, *Scilla* en *Ledebouria*, wat erken word. Vier soorte word in *Scilla* erken en vyftien in *Ledebouria*. Sinonieme word ten volle behandel en aantekeninge oor die verspreiding en verwantskappe van elke soort vul die kort beskrywings vir elke soort aan (slegs *Ledebouria* soorte). Veertien nuwe kombinasies word gemaak en twee nuwe soorte, *L. luteola* en *L. viscosa*, beskryf.

INTRODUCTION

In 1781, C. Linnaeus the younger, described *Hyacinthus revolutus* from the Cape of Good Hope, basing it on a specimen collected by C. P. Thunberg. Other related species were subsequently described by Thunberg, Jacquin and others under a range of generic names including *Lachenalia* and *Drimia*. It was not until 1820 that a South African species was placed in the genus *Scilla*, a genus originally described by Linnaeus Senior, for several northern hemisphere species. Then, in the second half of the nineteenth century, J. G. Baker transferred *Hyacinthus revolutus* and several species, previously placed in other genera, to *Scilla*. He contributed nearly seventy species, either new or by new combinations, to the list of South African species placed in *Scilla*.

Towards the middle of the present century, F. Z. van der Merwe did much to build up the herbarium record of the genus *Scilla* in its wider sense, describing new species and working on the generic concepts. He recognised three genera

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within *Scilla*, as had been recognised by, for example, Baker. Most of the species he retained in his concept of *Scilla*, but he described (1943) a new genus for a small group in which the tops of the bulbs are fibrous. This he called *Schizocarphus*. He also described (1946) a new genus *Resnova* for a small group, which the present author considers to have significant similarities with *Drimiopsis* Lindl. and to differ from the other species of *Scilla* on both floral and vegetative characters. E. P. Phillips, in his "Genera of South African Flowering Plants," 1951, preferred to include *Resnova* and *Schizocarphus* within *Scilla*.

In 1821, Roth described *Ledebouria hyacinthina* from India. No further species have been described under this generic name and this species was transferred to *Scilla* by Baker in 1870. However, in the Flora Capensis, Baker retained the name *Ledebouria* for the largest section of *Scilla* in South Africa.

Generic concepts have continued to give trouble, leading to numerous changes in combinations throughout the taxonomic history of this group. Furthermore, the species concepts are also considered by the present author to be the source of considerable nomenclatural and taxonomic confusion. At present, over one hundred valid combinations exist in *Scilla* in South Africa, yet few of these names are applied with any certainty in practice. The present treatment approaches the problem with a very different species concept from that of the earlier treatments. It may be that the "lumping" involved has been too drastic, but in order to establish a stronger foundation on which to build, it is believed that this is necessary at this stage. It is hoped that further long-term studies will show that the complexes recognised here provide a practical subdivision of the genus in its widest context, providing basic units on which to conduct detailed investigations. While the author does not, in several cases, believe that these units will prove to be entirely compatible with a satisfactory species concept, it is hoped that use of the binomials for these complexes will provide a nomenclature which will be useful as an interim classification.

ACKNOWLEDGEMENTS

Mrs A. A. Mauve's knowledge of the Liliaceae has been invaluable. Her suggestions have often provided leads to ideas and concepts adopted in this treatment. Students at Rhodes University, Grahamstown, have assisted with much of the experimental work. Mr M. S. Caulton investigated leaf anatomy, Mr K. Easton worked on developing a chromatographic technique, Miss M. M. Gebbie and Miss B. Staker investigated the bulb morphology, Sister M. Hausmann and Miss L. Smook studied the cytology and Sister Hausmann also worked on seedling development. Without their assistance, these aspects would have been greatly curtailed. Col. R. D. A. Bayliss and Mr R. G. Strey have assisted considerably with building up a collection of living material.

The curators of the Albany Museum, Bolus, Botanical Research Institute

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GENERIC CONCEPTS

The species of *Resnova* sensu Van der Merwe are not included in this discussion. It is intended to deal with this group together with *Drimiopsis* in the near future.

Living material of the other main groups within *Scilla* sensu Phillips was available, and has been examined in several ways. Unfortunately, neither the time nor material has been available to make a thorough examination of features other than those purely morphological ones which can be determined from herbarium material.

Three main groups are recognised within this generic complex by the present author. These are provisionally termed *Scilla*, *Ledebouria* and *Schizocarphus*,

TABLE 1.—Comparison of the significant morphological features of *Scilla*, *Schizocarphus* and *Ledebouria*.

Scilla	*Schizocarphus*	*Ledebouria*
Bulb scales without fibres at apex	Bulb scales with fibres at apex	Bulb scales without fibres at apex
Leaves uniformly green	Leaves uniformly green or with a pink or reddish colouring towards the base	Leaves often conspicuously spotted
Inflorescence terminal	Inflorescence terminal	Inflorescence axillary
Inflorescence erect and rigid	Inflorescence erect and rigid	Inflorescence usually flexuose and softer
Perianth segments blue or rarely pink or white	Perianth segments ±white	Perianth segments often pink, or white strongly marked with green
Filaments united towards the base	Filaments united towards the base	Filaments free of one another
Ovary oblong	Ovary oblong	Ovary conical, expanding to a wide base below which it contracts very abruptly to the distinct pedicel
Ovules axile, several (rarely 2) in each locule	Ovules axile, several in each locule	Ovules basal, paired in each locule

which are the earliest valid generic names which could be applied to these groups should it be considered advisable to recognise them as distinct genera.

Morphology: Table 1 summarises the important points of comparison between the members of the three groups.

The morphology of the bulb apex has been investigated for several species. In species of *Scilla* and *Schizocarphus* the inflorescence appears to arise apically and is usually solitary. In most species of *Ledebouria* the inflorescence appears axillary, and there are usually 2 or 3 per bulb. To determine the origin of the inflorescence, serial longitudinal sections were cut through the apex of bulbs. These sections can be interpreted as supporting this apparent difference, and

TABLE 2.—Published data on chromosomes of South African species of *Scilla* sensu lato and unpublished records by the present author. (Voucher specimens for unpublished records are preserved in the herbarium of the Botany Department, Rhodes University.)

Species	Number	Size Range	Author
Scilla group:—			
S. firmifolia	2n:18	1·2—4·3μ, estimated from drawing	De Wet
S. firmifolia (origin unknown, Rhodes Botany Dept. Garden No. 83)	2n:18	2—10μ	Jessop and Hausmann (ined.)
S. natalensis	2n:32		De Wet
Schizocarphus group:—			
S. nervosa (gerrardii form) (Grahamstown, *Jessop* 885)	2n:42	1—10μ	Jessop and Hausmann (ined.)
S. nervosa	2n:28, 56	1·2—2·5μ, estimated from drawing	De Wet
Ledebouria group:—			
L. apertiflora (=*S. linearifolia*)	2n:24		Fernandes & Neves
L. cooperi (Peddie, *Bayliss* BS/3226)	n:c.22		Jessop (ined.)
L. cooperi (Port Shepstone, *Strey* 9291)	n:12, 14	1·7—4·3μ	Jessop (ined.)
L. floribunda (Grahamstown, *Jessop* in Rhodes Botany Dept. Garden no. 33)	n:18 or 19	2·4—3·9μ	Jessop (ined.)
L. revoluta (=*S. lanceaefolia*) (Grahamstown, *Easton* in Rhodes Botany Dept. Garden no. 40)	n:15		Jessop (ined.)
L. revoluta (Grahamstown, *Smook* s.n.)	not counted	1·1—5·3μ	Jessop & Smook (ined.)
L. revoluta (20 miles N. of Pretoria, *Jessop* in Rhodes Botany Dept. Garden no. 135)	n:15		Jessop (ined.)
L. undulata (Graaff Reinet, *Bayliss* BS/3910)	n:18 or 19	2·4—3·9μ	Jessop (ined.)
L. undulata (Swaziland, *Bayliss* BS/3469)	n:18		Jessop (ined.)

indicate that the inflorescence of *Ledebouria* is axillary even in those species where it appears terminal externally. It is, however, doubted whether this method gives absolute certainty as to the origin of the inflorescence.

Cytology: Little work has been done on this aspect. Previous work by Kwiton Jong (unpublished thesis, 1961) and De Wet (1957) indicate a wide range in number of chromosomes—even within a single population. All counts except those of Kwiton Jong, which are unpublished, are shown in Table 2.

Although, in several cases, it appears that there is a certain amount of variation in chromosome numbers within material from a single plant, no other evidence of anomalous pairing in meiosis of pollen mother cells was found by the present author.

The distribution of chromosomes in various size groups in the complement of each species suggests that there may be significant characters to be obtained. However, it does not seem that overall numbers or range in size will be of very great value. Further work will be carried out.

Anatomy: Anatomical work has been done on the leaf anatomy of five specimens of *Ledebouria*, three of *Schizocarphus*, and three of *Scilla*. This covers all South African species, recognised by the present author, of the latter two groups and a representative sample of the former one. The species of *Ledebouria* appear to differ from the others in the possession of a palisade layer and in lacking a lignified bundle cap. However, no bundle cap was found in *S. plumbea* (*Scilla*). In these aspects, *S. plumbea* is similar to two northern hemisphere species of *Scilla* sensu lato, examined (i.e. *S. peruviana* and *Endymion non-scriptus*). It seems possible that the presence or absence of a palisade layer, but not the bundle cap, may prove to be of value.

Chromatography: Following the methods used in other groups (c.f. Riley and Bryant, 1961, and Riley and Isbell, 1963) a simple paper chromatography was employed. Two solvents were tried on both methanol extracts and on smears. Para-anisedene hydrochloride and ultra violet light were used to characterise the spots. However, the spots were not sufficiently well distinguished either on position or colour, and the results of comparisons between members of this generic complex and other apparently less closely related genera proved very confusing.

Germination stages: Study of the early germination stages of a specimen of *S. nervosa* (*Schizocarphus*) and of *S. firmifolia* (*Scilla*) suggests considerable differences between these species. Chouard (1930), however, showed that both patterns occur in several genera of the Liliaceae. It does not appear that these patterns, which he called "épigé" and "hypogé", show any relation to generic concepts in the Scilleae. This does not preclude the possibility that the apparent anomalies are a result of faulty concepts rather than with non-correlation between germination stages and affinity.

Summary of generic characters: The origin of the inflorescence, the leaf anatomy, the fusion of the basal parts of the filaments, the shape of the ovary and arrangement of the ovules suggest very much closer affinities between the species of *Scilla* and *Schizocarphus* than between either of these groups and *Ledebouria.* Only on the fragmentary cytological evidence, the germination stages, and on the fibrous apex to the bulb-scales could *Schizocarphus* be separated as a distinct genus at this stage. It is felt that without further evidence these characters do not provide satisfactory criteria for maintaining *Schizocarphus* as a distinct genus and it is, therefore, not recognised as such in this treatment. On the other hand it is thought possible that further data may not justify this attitude. *Ledebouria* must be accepted as not only generically distinct, but possibly not even belonging to a particularly closely allied group within the Scilleae.

SPECIES CONCEPTS

It has been found that the members of a population do not vary greatly from one another except in size. Two examples, based on rather small samples, illustrate the variation encountered in very restricted areas (see fig. 1). In both cases there is a fairly wide spread of sizes and proportions of the leaves.

In the Scilleae there are very few qualitative characters that could be used in taxonomic work. The distribution and form of spotting or marking of the leaves have been found to be extremely inconsistent in almost all populations. Similarily, whether the leaves are erect or prostrate is greatly influenced by both the time of year in relation to flowering and climate and the height and density of the surrounding vegetation.

Floral characters are of great value in delimiting genera, but there is often very little variation in floral structure within these genera.

It has been found that whether a broad or narrow concept of the species limits is taken, intermediates between even the largest and smallest forms of the genera treated here occur. There are very few species of *Ledebouria* which are defined on really satisfactory qualitative characters. These are *L. hypoxidioides*, *L. viscosa*, *L. ovatifolia* and perhaps *L. luteola*. The remainder are based on less well-defined characters and most show very considerable amounts of variation. In *Scilla*, *S. plumbea* and *S. firmifolia* are well-defined, but the other two species recognised each include wide ranges of forms.

One possible explanation for the difficulty in defining species in these genera may be a predominance of non-sexual reproduction, particularly apomixis.

Apomictic groups are notoriously difficult to describe in terms of conventional taxonomy. It would be very helpful to know to what extent, if any, apomixis occurs in the Scilleae. The possibility seems to be supported by the rarity of fruits, especially in *Ledebouria.* Even in hand-pollinated flowers seeds are frequently not produced. The evidence, although scant as yet, seems to support, rather than oppose, the presence of chromosomal abnormalities, as shown by meiotic numbers.

In eight plants examined by the present author, by the method of Alexander (1969), one showed 60% sterility of pollen, but half the plants showed less than 10% sterility. Little or no success has been had with the germination of pollen on cellophane using the method found satisfactory by Wilsenach and Papenfus (1967). The occasional presence of aborted flower buds on otherwise normal inflorescences (especially frequent towards the base) may indicate abnormalities in floral morphogenesis, which might possibly also extend to the sexual parts of apparently normal flowers.

On the other hand no evidence of anomalous meiotic pairing of chromosomes has been found in the limited pollen mother cell material of seven plants, examined by the author.

No conclusion as to the presence or absence of apomixis can, therefore, be reached at this point.

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Key to the genera

A key to the genera described in this paper and the second paper in this series will be included in the next paper.

SCILLA L.

Sp. Pl.: 308 (1753).

Scilla sensu Bak. in Fl. Cap. **6:** 478 (1896), partly; sensu Phill., Gen. S. Afr. Flower, Pl.: 191 (1951), partly. *Schizocarphus* Van der Merwe in Flower. Pl. S. Afr. **23:** t.904 (1943). Type species: *S. nervosus* (*Burch.*) Van der Merwe.

Bulbs present, sometimes fibrous towards the top. *Leaves* all basal, sometimes with reddish markings towards the base, but not spotted. *Inflorescence* erect, originating from the apical bud of the bulb, rarely branched. *Bracts* single or paired, not spurred. *Perianth* segments similar or almost so, usually spreading. *Filaments* connate towards the base. *Ovary* oblong, usually with more than 2 ovules per locule. *Ovules* axile.

Type: S. bifolia L., from Europe.

The affinities of *Scilla* with South African genera other than *Ledebouria, Resnova* and *Drimiopsis* has not been fully investigated. It is worth mentioning *Pseudogaltonia* in which the bulb has fibres similar to those characterising *S. nervosa* and which has the floral characters of *Scilla* except that the perianth is zygomorphic.

Descriptions of the species have not been included as the important features appear in the key.

KEY OF SPECIES OF SCILLA IN SOUTH AFRICA

Perianth a vivid blue or purplish blue.
    Perianth segments ascending. Leaves linear to lanceolate. Restricted to the south-western Cape . . . . 1. *plumbea*
    Perianth segments spreading. Leaves lanceolate to ovate. Eastern Cape through Natal to the eastern Transvaal . . . . 2. *natalensis*
Perianth white, greenish or pink.
    Bulbs without fibrous tops. Inflorescence sometimes branched. Leaves usually less than 125 mm long. Restricted to the Alicedale, Bathurst, Peddie area 3. *firmifolia*
    Bulbs with fibrous tops. Inflorescence always simple. Leaves usually more than 125 mm long. Widespread . . . . 4. *nervosa*

1. **Scilla plumbea** Lindl. in Bot. Reg. **16:** t.1355 (1830). Type: Bot. Reg. **16:** t.1355 (1830); figured from a plant in cultivation in England.

Scilla ?natalensis, pro parte, sensu Bak. in Fl. Cap. **6:** 482 (1896).

Restricted to the south-western Cape in the vicinity of Bain's Kloof.

For illustration and discussion of typification, see Lewis, G. J. in *Flower. Pl. Afr.* **26:** t.1006 (1947).

Selected specimens:

CAPE—3319 (Worcester): Bain's Kloof mountains, *Van Breda 907* (NBG, PRE); Baviaans Kloof, *Linley* s.n. in SAM *56004* (BOL, NBG, PRE, SAM); without locality, *Drège 1997* (G).

2. **Scilla natalensis** Planch. in Flore des Serres: t.1043 (1855). Type: Flore des Serres: t.1043 (1855). *Scilla kraussii* Bak. in J. Linn. Soc. (Bot.) **13:** 243 (1873). Type: "Natalia", *Krauss* 444 (K, lecto.; PRE, photo.!), without locality, *Gerrard* 740.

Occurs in the eastern Cape as far west as Kentani, Lesotho, Natal, Swaziland, eastern O.F.S., and Transvaal mainly along the escarpment.

In the south of its range the leaves of the larger plants (peduncles more than 300 mm long) are glabrous, but in the Transvaal they are almost always pubescent. The smaller plants (peduncles less than 350 mm long) are restricted to the southern part of this species range and are pubescent. On *Rogers* 12507 (BOL) is a note that in the Tzaneen area, although usually pubescent, the leaves are glabrous in plants growing in a vlei or a garden.

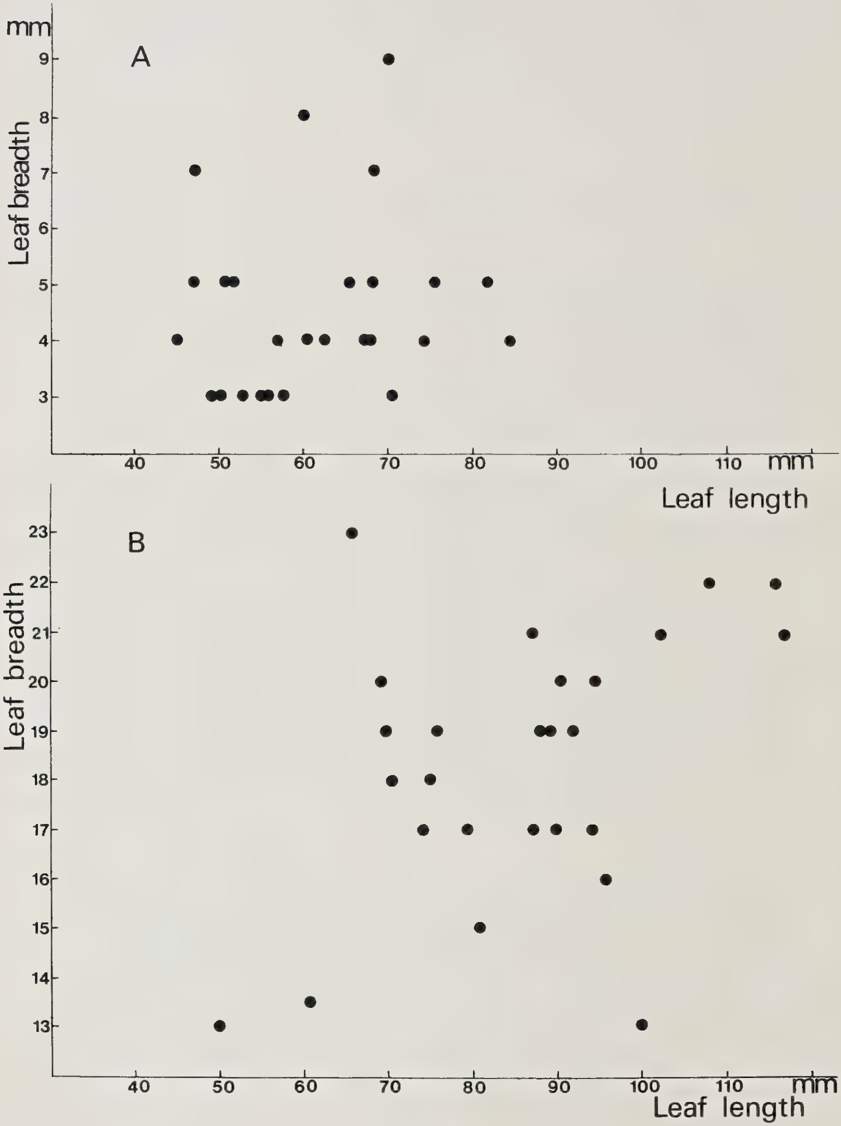
It has been extremely difficult to decide whether or not to give the larger and smaller forms taxonomic recognition. In view of the evidence that pubescence may be not entirely a genetically determined phenomenon and in view of the range in size of the pubescent-leafed plants only a single taxon is recognised here. Populations examined by the author near Kamberg and the Oliviershoek Pass (Natal) and near Tzaneen exhibited such a range in size of plant and pubescence that it did not appear likely that any subdivision of this complex would serve any useful purpose.

Selected specimens:

TRANSVAAL—2531 (Komatipoort): Barberton, *Galpin 619* (BOL, PRE).
LESOTHO—2828 (Bethlehem): Leribe, *Dieterlen 416* (PRE).
NATAL—2930 (Pietermaritzburg): near York, *Wood 4304* (BOL, NH, PRE).
CAPE—Pondoland without precise locality, *Bachmann 286* (Z).

3. **Scilla firmifolia** Bak. in Saund., Ref. Bot. **3,** app.: 7 (1870). *Type:* "Cape of Good Hope", *MacOwan* 461 (K, lecto., PRE, photo.!; GRA!; PRE!), "Eastern frontier", *Drège* 4492 (K; PRE, photo.!).

Restricted to a small part of the eastern Cape from Bathurst to Peddie and inland as far as Alicedale.


A
mm
Leaf breadth
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mm
Leaf length

This is the only species of *Scilla* in South Africa in which the inflorescence is sometimes branched.

For illustration, see Van der Merwe, F. Z. in *Flower. Pl. Afr.* **24:** t.926 (1944).

Selected specimens:

CAPE—3326 (Grahamstown): Grahamstown, *Rogers 30104* (Z); 3327 (Peddie): ½ mile south of Kaffir Drift, *Dyer 3374* (NH, PRE); Line Drift, *Sim 4060* (PRE).

4. **Scilla nervosa** (Burch.) Jess., comb. nov.

Ornithogalum nervosum Burch., Trav. **1:** 537 (1822). *Type:* Cape, "between Griquatown and Witte Water", *Burchell* 1968 (K, holo.; PRE, photo.!).

Schizocarphus nervosus (Burch.) Van der Merwe in Flower. Pl. S. Afr. **23:** t.904 (1943).

Scilla rigidifolia Kunth, Enum. Pl. **4:** 330 (1843). *Type:* Cape, *Drège* 4560b (K; PRE, photo.!).

Schizocarphus rigidifolius (Kunth) Van der Merwe in Flower. Pl. S. Afr. **23:** t.905 (1943).

Scilla pallidiflora Bak. in Saund., Ref. Bot. **3:** t.179 (1870). *Type:* Saund., Ref. Bot. **3:** t.179 (1870).

Scilla versicolor Bak. in Saund., Ref. Bot. **5:** t.305 (1873). *Type:* Saund., Ref. Bot. **5:** t.305 (1873).

Scilla gerrardii Bak. in J. Linn. Soc. (Bot.) **13:** 237 (1873). *Type:* "Natalia", *Gerrard* 1829 (K, lecto.; PRE, photo.!), "Kaffraria", *Hutton* s.n.

Schizocarphus gerrardii (Bak.) Van der Merwe in Flower. Pl. S. Afr. **23:** t.906 (1943).

*Scilla pubescenc~~e~~*s Bak. in Bull. Herb. Boissier, ser. 2, **1:** 853 (1901). *Type:* Natal, near Howick, *Schlechter* 6799 (Z!).

Schizocarphus acerosus Van der Merwe in Flower. Pl. S. Afr. **23:** t.904 (1943.) *Type:* Transvaal, Middelburg, Elandspruit, *Van der Merwe* 2236 (PRE!).

Occurs throughout the eastern Cape from Alexandria eastward through Lesotho and Natal into the northern Cape, O.F.S., Swaziland, Transvaal and Botswana as far north as Angola and Tanzania.

Attempts at subdividing the complex on the basis of leaf measurements, as used by Van der Merwe, have not been found useful; see fig. 2.

FIG. 1.—Diagrams to illustrate variation in leaf size in small natural populations.

A. *Scilla nervosa.* Population area—80 sq. metres. 15 miles S.E. of Kamberg on road to Nottingham Road (2929; Underberg, Natal).

B. *Ledebouria marginata.* Population area—2,000 sq. metres. 12 miles north of Cathcart (3227; Stutterheim, Cape).

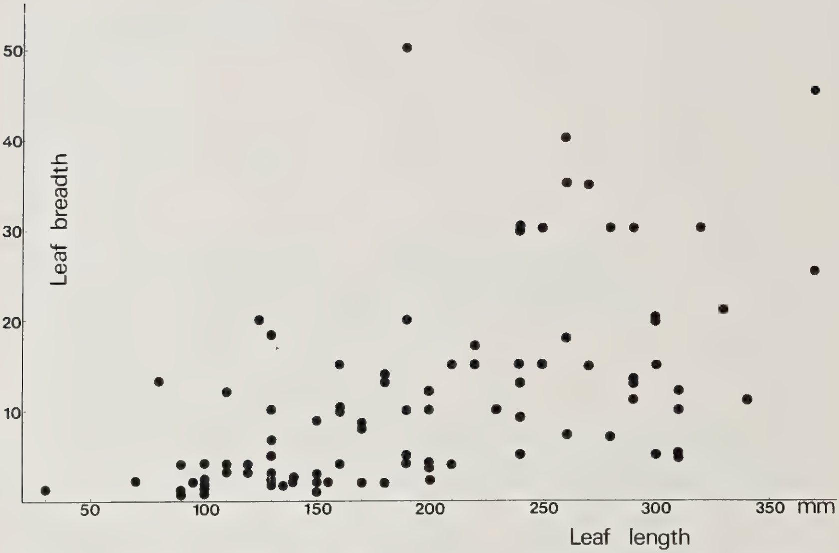

FIG. 2.—Diagram to illustrate variation in leaf size in *Scilla nervosa;* based on herbarium specimens.

Selected specimens:

S.W.A.—1720 (Sambio): 3 miles east of Masari Camp, *De Winter 4103* (PRE).
TRANSVAAL—2430 (Pilgrim's Rest): Wolkberg, *Gerstner 5606* (PRE).
BOTSWANA—2525 (Mafeking): Lobatsi, *Rogers 30480* (Z).
NATAL—2829 (Harrismith): Van Reenen, *Wood 12173* (PRE).
O.F.S.—2926 (Bloemfontein): Bloemfontein, *Bolus 10824* (BOL, PRE).
LESOTHO—2927 (Maseru): "Mafeteng district", *Dieterlen 1312* (PRE).
CAPE—3228 (Butterworth): Kentani, *Pegler 362* (PRE).

LEDEBOURIA ROTH

Novae plantarum species (1821).

Scilla sensu Bak. in Fl. Cap. **6:** 478 (1896), partly; sensu Phill., Gen. S. Afr. Flower, Pl.: 191 (1951), partly.

Bulbs present, never fibrous towards the top. *Leaves* all basal, often with reddish or green spots or markings, especially on the upper surface. *Inflorescence* usually cernuous, axillary in origin, always simple. *Bracts* poorly developed, single or paired, not spurred. *Perianth segments* reflexed to ascending. *Filaments* free of one another. *Ovary* conical, expanding to a wide base below which it contracts abruptly, with two ovules per locule. *Ovules* basal.

Type: L. hyacinthina Roth (=*S. indica* Bak.), from India. (For figure, see *Curtis's bot. Mag.* **60:** t.3226; 1833.)

KEY TO SPECIES OF LEDEBOURIA IN SOUTH AFRICA

1. Bulb small, less than 25 mm long, or if longer then less than one sixth of the length of the longest leaves at flowering, very rarely with any pink colour, often with only one membranous outer bulb scale. Leaves usually rather soft; the lamina of the outermost often greatly reduced or absent. Flowers and pedicels often uniformly pink.

2. Bulb above ground, very rarely over 20 mm long. Leaves often with a silvery colour on the upper surface. Eastern Cape . . . . 4. *socialis*

2. Bulb usually below ground. Leaves probably never with a silvery colour on the upper surface. Wide-spread.

3. Bulb more than 40 mm long, with numerous tightly arranged scales 6. *apertiflora*

3. Bulb 25—40 mm long, with fewer, relatively loosely arranged scales 2. *cooperi*

3. Bulb less than 25 mm long, with few or many loosely or tightly arranged scales.

4. Bulb with several dry outer scales which often form a neck. Leaves more or less erect, not considerably narrowed to the base. Inflorescence variable. Flowers pink-striped, greenish or greyish. Mainly in dry areas 9. *undulata*

4. Bulb with several dry outer scales, never forming a neck. Leaves more or less spreading, narrowing considerably to the base. Inflorescence lax. Flowers pink-striped. Southern Cape west of Knysna . . . . . 1. *ovalifolia*

4. Bulb with very few (usually not more than 2 or 3) or no dry outer scales, which never form a neck. Leaves variable in shape. Inflorescence usually very compact. Flowers often uniformly pink. Wide-spread east of Knysna 2. *cooperi*

1. Bulb generally at least 30 mm long and more than one sixth of the length of the longest leaves at flowering, sometimes partly pink usually with several membranous outer bulb scales. Leaves firmer; the lamina of the outermost not appreciably smaller than the others. Flowers either greenish, greyish or with pink markings, but probably never uniformly pink.

5. Leaves viscid. Kransberg, Thabazimbi area of the Transvaal . . 15. *viscosa*

5. Leaves densely hairy. Grahamstown . . . . 14. *hypoxidioides*

5. Leaves neither viscid nor hairy.

6. Bulb scales of very different heights, all relatively firm, producing copious threads when torn. Leaves, at least towards the end of the flowering season, usually ovate and appressed to the ground . . . . . . 13. *ovatifolia*

6. Bulb scales all reaching approximately the same height at the top of the bulb, the outermost forming dry tunics, producing thread, when torn, in only one species. Leaves usually erect or erect-spreading and ovate to linear.

7. Bulb scales usually yellow especially when dried, except for the few membranous outer ones, longitudinally ridged and producing copious threads when torn—these threads usually showing even on herbarium material 12. *luteola*

7. Bulb scales not as above.

8. Leaves over 150 mm long; usually much longer than the bulb at flowering.

9. Bulbs over 70 mm long. Flowers usually more than 150 per inflorescence . . . . 3. *floribunda*

9. Bulbs less than 70 mm long. Flowers usually fewer than 150 per inflorescence.

10. Leaves linear or narrowly linear-lanceolate, long attenuate, usually over 200 mm long, and less than 20 [–25] mm broad 6. *apertiflora*

10. Leaves lanceolate to oblong-lanceolate, usually not very attenuate, and broadest near the middle, usually under 220 mm long, and more than 25 mm broad . . . . 7. *revoluta*

8. Leaves less than 150 mm long, often shorter than the bulb at flowering.

11. Leaves shorter than the bulb at flowering, or if longer then lanceolate to ovate and more than 10 mm broad.

12. Leaves very glaucous, erect, not very firm. Bulb tunics partly dark and shiny and usually with a pinkish wash 8. *inquinata*

12. Leaves not very glaucous, erect or spreading, variable in texture. Bulb tunics with or without dark shiny areas, but pink colour, when produced, generally in the form of speckling.
    13. Leaves rather firm so that they retain their shape on the plant for several months after they have dried out, rather long attenuate in the distal half and usually spirally twisted . . . . 11. *marginata*
    13. Leaves softer, wrinkling and disintegrating rapidly after their death, not as strongly attenuate or spirally twisted.
        14. Bulb largely above ground. Leaves erect, usually undulate and uniformally green. Eastern Cape 5. *concolor*
        14. Bulb below ground. Leaves erect-spreading to spreading, not undulate, usually spotted. Widespread . . . . 7. *revoluta*

11. Leaves usually longer than the bulb at flowering, often linear to linear-lanceolate and less than 10 mm broad.
    15. Leaves more than 200 mm long, linear or narrowly linear-lanceolate . . . . 6. *apertiflora*
    15. Leaves less than 150 mm long, lanceolate to linear.
        16. Leaves usually 10 or more, usually twisted, less than 5 mm broad . . . . 10. *graminifolia*
        16. Leaves usually fewer than 10, often 5—10 mm broad. 9. *undulata*

1. **Ledebouria ovalifolia** (Schrad.) Jess., comb. nov. *Drimia ovalifolia* Schrad., Blumenb.: 28 (1827). *Type:* Lodd. Bot. Cab.: 278, sub *Drimia lanceaefolia*, (1818).

Scilla ovalifolia (Schrad.) C.A.Sm. in Kew Bull. 1930: 245 (1930).

Lachenalia reflexa Andr. Bot. Rep. **5:** t.299 (1803), nom. illegit., non Thunb.

Drimia gawleri Schrad., Blumenb.: 30 (1827). *Type:* Curtis's bot. Mag. **33:** t.1380, sub *Drimia lanceaefolia* (β), (1811).

Drimia lanceolata Schrad., Blumenb.: 28 (1827). *Type:* Andr. Bot. Rep. **5:** t.299, sub *Lachenalia reflexa* (1803).

Scilla lanceolata (Schrad.) Bak. in Saund., Ref. Bot. **3,** app.: 14 (1870).

Scilla revoluta (L.f.) Bak. sensu Bak. in Fl. Cap. **6:** 485 (1896), non L.f.

Scilla genadendalensis Von Poelln. in Port. Acta biol., ser. B, **1:** 212 (1945). *Type:* Cape, Genadendal, *Schlechter* 10327 (BOL!, GRA!, PRE!, Z!).

Scilla doratophylla C.A.Sm. in Kew Bull. 1930: 245 (1930). *Type:* as for *Drimia lanceolata* Schrad.

Bulbs 15—25 mm long. *Leaves* 3—5, 15—35 mm long, 6—11 mm broad, spreading or somewhat erect-spreading, with a distinctly petiole-like base; the sides of the leaf towards the base usually turned up, forming a gutterlike shape, the sides folding in in dried material. *Inflorescence* 60—90 mm long with a rather lax arrangement of the spreading pedicels. *Flowers* usually fewer than 20, "dull red".

Has been collected from Bot River, in the west, to Plettenberg Bay in the east; being restricted to the coastal belt, although occurring as far inland as Bonnievale. Records suggest a preference for rocky habitats.

In the east of its range it merges with the smaller forms of *L. cooperi*. The leaf-form does not always provide adequate grounds for separation, but the laxer inflorescence in *L. ovalifolia* can generally be regarded as diagnostic. Confusion with *L. revoluta* is also possible, but the shape of the base of the leaf, the smaller bulb and form of the inflorescence provide characters for separation.

Selected specimens:

CAPE—3419 (Caledon): Bot River valley, *Guthrie 2321* (BOL); 3420 (Bredasdorp): De Hoop, *Barker 8744* (NBG); 3423 (Knysna): Plettenberg Bay, *Newdigate* s.n. in Herb Duthie *1207* (BOL).

2. **Ledebouria cooperi** (Hook.f.) Jess., comb. nov.

Scilla cooperi Hook.f. in Curtis's bot. Mag. **92:** t.5580 (1866). *Type:* Cape, *Cooper* s.n. (K, holo.; PRE, photo.!).

Scilla subglauca Bak. in Saund. Ref. Bot. **3:** t.186 (1870). *Type:* Saund., Ref. Bot. **3:** t.186, "Cape of Good Hope, *Cooper*", (1870).

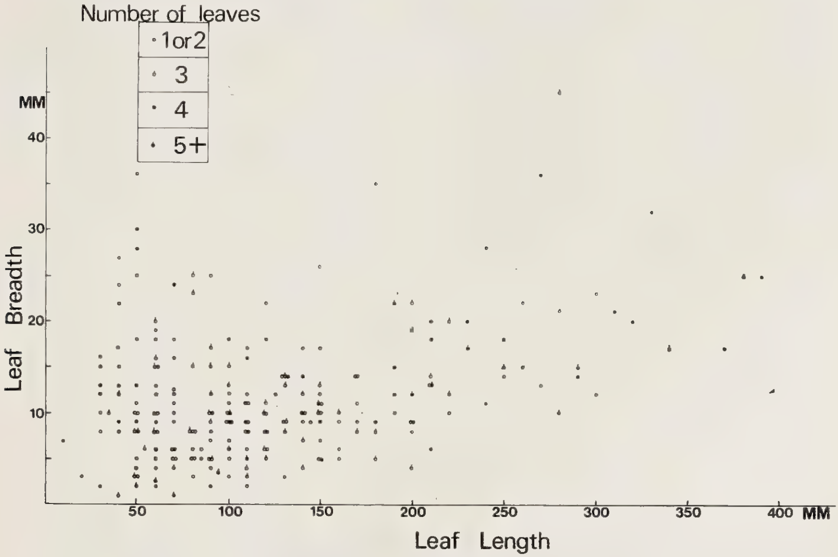

FIG. 3.—Diagram to illustrate variation in leaf size and number in the *Ledebouria cooperi* complex; based on herbarium specimens.

Scilla sandersonii Bak. in Saund., Ref. Bot. **3**, app.: 5 (1870). *Type:* Transvaal, *Sanderson* s.n. (K, holo.; PRE, photo.!).

Scilla minima Bak. in Saund., Ref. Bot. **3**, app.: 6 (1870). *Type:* Transvaal, Magaliesberg, *Burke* s.n. (K, holo.; PRE, photo.!; BOL, drawing!).

Scilla concinna Bak. in Saund., Ref. Bot. **4:** t.235 (1870). *Type:* Saund., Ref. Bot. **4:** t.235, "Cape Colony, *Cooper*", (1870).

Scilla saturata Bak. in J. Bot., Lond. 1874: 365 (1874). *Type:* Orange Free State, *Cooper* 993 (K, holo.; PRE, photo.!).

Scilla macowanii Bak. in Gdnrs' Chron. **3:** 748 (1875). *Type:* Cape, "Somerset Division", Boschberg, *MacOwan* 1841 (BOL!; GRA!, PRE, photo.!; Z!).

Scilla pusilla Bak. in J. Bot., Lond. 1876: 183 (1876). *Type:* Cape, Bazeia, *Baur* 293 (K, holo.; PRE, photo.!; BOL, drawing!; SAM!).

Scilla adlamii Bak. in Gdnrs' Chron. **9:** 521 (1891). *Type:* Natal, *Adlam* s.n. (K, holo.; PRE, photo.!; BOL, drawing!).

Scilla leptophylla Bak. in Fl. Cap. **6:** 483 (1896). *Type:* Transvaal, "near the Devil's Kantoor", *Bolus* 7623 (K, holo.; BOL, drawing! and iso.!).

Scilla tysonii Bak. in Fl. Cap. **6:** 484 (1896). *Type:* Cape, "Griqualand East", *Tyson* s.n. (K, holo.; BOL & GRA, drawings!).

?Scilla sphaerocephala Bak. in Fl. Cap. **6:** 484 (1896). *Type:* Cape, Little Namaqualand, *Bolus* s.n. (Type not seen, determination from description. There appears to be no specimen at Kew or the Bolus Herbariam, but the description fits this concept of *L. cooperi* in every aspect—only the locality being out of the typical range.)

Scilla inandensis Bak. in Fl. Cap. **6:** 483 (1896). *Type:* Natal, Inanda, *Wood* 630 (BOL!; NH!; SAM!); "near Tongaat River", *Saunders* s.n.

Scilla globosa Bak. in Fl. Cap. **6:** 484 (1896). *Type:* Cape, near Kokstad, *Tyson* s.n. (?*Tyson* 1557 in BOL! and SAM!).

Scilla baurii Bak. in Fl. Cap. **6:** 484 (1896). *Type:* Cape, "Tembuland, Bazeia Mountain", *Baur* 550 (K, holo.; PRE, photo.!; SAM!).

Scilla rogersii Bak. in Fl. Cap. **6:** 484: (1896). *Type:* South Africa, *Rogers* s.n. (K, holo.; PRE, photo.!).

Scilla leichtlinii Bak. in Fl. Cap. **6:** 486 (1896). *Type:* South Africa ex hort. Leichtlin (K, holo.; PRE, photo.!; BOL, drawing!).

Scilla galpinii Bak. in Fl. Cap. **6:** 487 (1896). *Type:* Transvaal, "summit of Devil's Kantoor", *Galpin* 672 (BOL!; GRA!; NH!, PRE, photo.!; PRE!; SAM!; Z!).

Scilla oostachys Bak. in Fl. Cap. **6:** 487 (1896). *Type:* Natal, "upper Umkomaas", *Wood* 4627 (K; BOL, drawing!); NH!, PRE, photo.!).

Scilla diphylla Bak. in Fl. Cap. **6:** 489 (1896). *Type:* Transvaal, "Saddleback range near Barberton", *Galpin* 1182 (K, holo.; TRE, photo.!; BOL, drawing!; BOL!; GRA!; NH!; PRE!: SAM!).

Scilla palustris Wood & Evans in J. Bot., Lond. 1899: 251 (1899). *Type:* Natal, Newcastle, *Wood* 6501 (NH, holo.!; PRE, photo.!).

Scilla rehmannii Bak. in Bull. Herb. Boissier, ser. 2, **1:** 853 (1901). *Type:* Natal, Inanda, *Rehmann* 8277 (Z!).

Scilla fehrii Bak. in Bull. Herb. Boissier, ser. 2, **1:** 788 (1901). *Type:* Transvaal, Pretoria, *Fehr* s.n. (Z!).

Scilla aggregata Bak. in Bull. Herb. Boissier, ser. 2, **4:** 1001 (1904). *Type:* Transvaal, Modderfontein, *Conrath* 701 (K, holo.; PRE, photo.!; GRAZ; PRE, photo.!).

Scilla tristachya Bak. in Bull. Herb. Boissier, ser. 2., **4:** 1001 (1904). *Type:* Transvaal, Modderfontein, *Conrath* 693 (GRAZ; PRE, photo.!; BOL, drawing!; Z!).

Scilla londonensis Bak. in Bull. Herb. Boissier, ser. 2, **4:** 1002 (1904). *Type:* Cape, East London, *Conrath* 694 (GRAZ; PRE, photo.!).

Scilla conrathii Bak. in Bull. Herb. Boissier, ser. 2, **4:** 1002 (1904). *Type:* Transvaal, Modderfontein, *Conrath* 132 (GRAZ; PRE, photo.!; K; PRE, photo.!).

Scilla lepida N.E.Br. in Kew Bull. 1921: 299 (1921). *Type:* Transvaal, Palala River, *Breyer* s.n. in Herb. Rogers 24009 (K, holo.; PRE, photo.!; BOL, drawing!; PRE!).

Scilla bella Markotter in Annale Univ. Stellenbosch, reeks A, **8,** afl. 1: 13 (1930). *Type:* Natal, Oliviershoekpas, *Thode* s.n. in STE 3372 (STE, holo.; PRE, photo.!).

Scilla cinerascens Van der Merwe in Flower. Pl. S. Afr. **21:** t.827 (1941). *Type:* Transvaal, Piet Retief, Wolwekop, *Van der Merwe* 1119 (PRE, holo.!).

Scilla rupestris Van der Merwe in Flower. Pl. S. Afr. **21:** t.828 (1941). *Type:* Transvaal, Pilgrims Rest near Mac Mac and Sabie, *Van der Merwe* 1586 (PRE, holo.!).

Scilla petiolata Van der Merwe in Flower. Pl. S. Afr. **21:** t.832 (1941). *Type:* Transvaal, near Graskop, *Strydom* s.n. (PRE, holo.!).

Scilla glaucescens Van der Merwe in Flower. Pl. S. Afr. **23:** t.912 (1943). *Type:* Transvaal, Carolina, Onbekend, *Van der Merwe* 2073 (PRE, holo.!).

Bulbs usually lacking, or with only a few, dark membranous outer scales, usually much shorter than the leaves, generally under 40 mm long. *Leaves* usually 1—3, [10–]30—250[–400] mm long, 1—20[–50] mm broad, erect, soft and slightly fleshy, often narrowing appreciably to the base, oblong, ovate or linear, but rarely attenuate. The outermost leaf often much shorter than the others, entirely clasping the bulb and hardly possessing any green colouring. *Inflorescence* usually more or less erect, usually with fewer than 50 flowers. *Perianth segments* often a rather uniform pink colour, less often green or pink with a green keel.

Wide-spread in South Africa except in the drier western areas and the south-western Cape. Probably rare in South West Africa, but extending northwards into Rhodesia. The type of *S. sphaerocephala* has not been located but was reported to have been collected in Namaqualand. It frequently occurs in dampish areas in the grassveld, but also on slopes and among rocks.

Vegetative reproduction by means of runners has been reported from near Belfast (*Van der Merwe* 1829; PRE).

There is very considerable morphological variation within this concept of *L. cooperi*. A number of series are indicated below. Whether or not these will prove to be worthy of taxonomic recognition has not been determined with any certainty, but it does appear that the degree of overlap between these series is such as to preclude their recognition at specific level. As the present author does not wish to accord these series taxonomic significance, it is suggested that, where it is desired to refer to them, their correct epithets, under *Scilla*, be used to identify them. The following binomials indicate their correct epithets if they were regarded as having specific status.

Cooperi series: Leaves linear-lanceolate, 160—300 mm long, about 20 mm broad.

This series merges with *L. apertiflora*, but has a smaller bulb with fewer scales and narrower, apparently softer, leaves and often showing characteristic longitudinal lines of the abaxial surface of the leaves. It also merges with *L. floribunda* but has narrower leaves and fewer-flowered inflorescences. (See Flower. Pl. S. Afr. **24:** t.943; 1944.)

Saturata series: A smaller edition of the cooperi series. Leaves up to 100—150 mm long, about 10 mm broad.

It is through this series that a gradation occurs between *L. cooperi* and *L. ovalifolia* of the south-western Cape. However, the inflorescence is generally more compact, and the leaves more strongly erect. (See Flower. Pl. S. Afr. **17:** t.674; 1937.)

Sandersonii series: Similar to the saturata series, but smaller and with ovate or lanceolate to almost orbicular leaves, often distinctly petiolate. (See Flower. Pl. S. Afr. **21:** t.832; 1941.)

Minima series: Similar to the previous series but with narrowly linear leaves.

Galpinii series: Similar to the sandersonii series but with the surface of the leaf pitted.

Probably restricted to the south-eastern Transvaal (Belfast degree block). (See Flower. Pl. S. Afr. **22:** t.864; 1942.)

The difficulty of giving these series, other than the galpinii series which is characterised by an apparently qualitative difference, taxonomic status is illustrated by means of a scatter diagram (fig. 3) in which the three main leaf variables are indicated. Differences in leaf size are largely genetic, but environment as well as the stage of leaf growth in relation to flowering probably add to the difficulty of using quantitative leaf characters in defining taxa in this species complex. The galpinii series differs from the sandersonii series only in the pitting of the leaf. The fact that this is the only difference and some evidence that this is not always clear-cut motivated the retention of this series within *L. cooperi*. The galpinii series appears to be the only one which is limited to only a small part of the range of the species complex as a whole.

Specimens occur linking the *L. cooperi* complex with several other species; in particular *L. ovalifolia*, *L. graminifolia* and *L. undulata*. The smaller bulb, and frequently uniformally pink flowers are useful characters. Although several specimens, placed by the present author in the *L. cooperi* complex, do have green or striped flowers, uniformally pink flowers rarely, if ever, occur in other species or complexes in *Ledebouria*.

Selected specimens:

Cooperi series:

TRANSVAAL—2528 (Pretoria): Rietvlei, *Repton 3132* (PRE).
LESOTHO—2828 (Bethlehem): Leribe, *Dieterlen* 57a (Z).
CAPE—3227 (Stutterheim): East London, *Rattray* s.n. (GRA); 3326 (Grahamstown): Blaauwkrantz, *Daly 1026* (BOL, GRA, Z).

Saturata series:

S.W.A.—1715 (Ondangua): Ondangua, *De Winter & Giess 6852* (PRE).
TRANSVAAL—Vaal River without precise locality, *Wilms 1530a* (G); 2527 (Rustenburg): near Rustenburg, *Pegler 975* (BOL).
SWAZILAND—2531 (Komatipoort): Nottingham Peak, Havelock Concession, *Saltmarshe* s.n. in Herb. *Galpin 1053* (BOL, GRA, PRE).
NATAL—2931 (Stanger): Claremont, *Schlechter 2959* (BOL, GRA, Z), *2959a* (G).

Sandersonii series:

TRANSVAAL—2530 (Lydenburg): Dullstroom, *Killick & Strey 2552* (PRE).
SWAZILAND—2631 (Mbabane): Mbabane, *Rogers 11589* (BOL).
O.F.S.—2729 (Volksrust): Vrede, *O'Meara* in NBG *1127A/33* (BOL, NBG).

Minima series:

TRANSVAAL—2528 (Pretoria) Irene, *Leendertz 675* (PRE); 2531 (Komatipoort): Komatipoort, *Schlecter 11795* (BOL, PRE).
SWAZILAND—2631 (Mbabane): Bomon Ridge, *Karsten* s.n. sub NBG *58478* (NBG).

3. **Ledebouria floribunda** (Bak.) Jess., comb. nov.

Scilla floribunda Bak. in Saund., Ref. Bot. **3:** t.188 (1870). *Type:* "Cape of Good Hope", *Cooper* s.n. (K, holo.; PRE, photo.!).

Scilla pendula Bak. in Saund., Ref. Bot. **3,** app.: 14 (1870). *Type:* "Cape of Good Hope", *Burchell* s.n. (K, holo.; BOL, drawing!).

Scilla princeps Bak. in Saund., Ref. Bot. **3:** t.189 (1870). *Type:* "Cape of Good Hope", *Cooper* s.n. (K, holo.; PRE, photo.!).

?Scilla spathulata Bak. in Saund., Ref. Bot. **3:** t.187 (1870). *Type:* Saund., Ref. Bot. **3:** t.187, "Cape of Good Hope, *Cooper* s.n.", (1870).

Scilla zebrina Bak. in Saund., Ref. Bot. **3:** t.185 (1870). *Type:* Saund., Ref. Bot. **3:** t.185, "Cape of Good Hope, *Cooper* s.n.", (1870).

Scilla polyantha Bak. in Gdnrs' Chron. **9:** 104 (1878). *Type:* Natal, York, in Hort. Bull s.n. (K, holo.; PRE, photo.!).

Scilla tricolor Bak. in Gdnrs' Chron. **14:** 230 (1880). *Type:* ?Cape, Port Elizabeth, *Elwes* (painting in K; PRE, photo of painting!; BOL, copy of painting!).

Scilla subsecunda Bak. in Gdnrs' Chron. **16:** 38 (1881). *Type:* "Eastern districts of Cape Colony", *Bowker* (K, holo.; PRE, photo.!; BOL, drawing!).

Scilla microscypha Bak. in Gdnrs' Chron. **16:** 102 (1881). *Type:* "Eastern provinces of Cape Colony", *Bowker* (K, holo.; PRE, photo.!).

Scilla livida Bak. in Gdnrs' Chron. **20:** 166 (1883). *Type:* "Cape of Good Hope, imported by Messrs. F. Horsman & Co." (K, holo.; PRE, photo.!; BOL, drawing!).

Scilla megaphylla Bak. in Fl. Cap. **6:** 490 (1896). *Type:* Transvaal, near Barberton, *Galpin* 1184 (GRA!; NH!; SAM!, PRE, photo.!).

Scilla moschata Schonl. in Rec. Albany Mus. **3:** 60 (1914). *Type:* Cape, Stutterheim, *Rogers* 12786 (GRA, holo.!; PRE, photo.!).

Scilla grandifolia Schonl. in Rec. Albany Mus. **3:** 61 (1914). *Type:* Transvaal, Tzaneen, Devil's Kloof, *Rogers* s.n., Dec. 1913 (GRA, holo.!; PRE, photo.!).

Scilla lauta N. E. Br. in Kew Bull. **1921:** 299 (1921). *Type:* Transvaal, Pietersburg Div., the Downs, *Rogers* 23990 (K, holo.; PRE, photo.!; BOL, drawing!).

Bulbs generally 70—150 mm long, usually more than a quarter of the length of the leaves. *Leaves* often 4 or 5, [140–] 200—350 [–450] mm long, 20—150 mm wide, more or less erect, fairly soft, linear-oblong to lanceolate, but not usually long-tapering. The outermost leaf not much smaller than the inner ones. *Inflorescence* more or less erect, often with 100 or more flowers. *Perianth segments* varying in colour—greyish, greenish or with pink, but not uniformally pink.

Occurs mainly in the northern and eastern Transvaal, Swaziland, Natal and the eastern Cape as far west as Grahamstown. Often recorded in seasonally damp places, but also occurs in drier localities such as slopes.

S. livida is placed in synonymy but shows leaf characters reminiscent of *L. concolor* and bulb characters of *L. revoluta*. However it does seem to be best placed here. *S. subsecunda* is also placed here with some hesitation. It shows some affinities with both *L. revoluta* and *L. undulata*.

L. floribunda is nearest to the large forms of *L. cooperi*, but differs in having a relatively large number of flowers, which are not uniformally pink, and in the relatively large bulb, with darker outer scales. It is also not always possible to distinguish *L. floribunda* from large forms of *L. revoluta* and *L. concolor*, but the large inflorescence and often relatively narrow basal region of the lamina of the leaves provide useful characters. (See Flower. Pl. S. Afr. **23:** t.898; 1943.)

A number of specimens from Zululand (e.g. *Ward* 2822 (NH) from Hluhluwe Game Reserve and *Venter* 602 (NH) from Ngoya Mountain) appear to be best regarded as small-bulbed forms of *L. floribunda*.

Selected specimens:

TRANSVAAL—2531 (Komatipoort): near Barberton, *Van der Merwe 2048* (PRE).
NATAL—2829 (Harrismith): Ladysmith, *Van der Merwe 2603* (PRE); 2831 (Eshowe): "Intunzini", *Gerstner* s.n. sub NH *22103* (NH).
CAPE—3227 (Stutterheim): near Komgha, *Flanagan 1112* (BOL, GRA, SAM).

4. **Ledebouria socialis** (Bak.) Jess., comb. nov.
Scilla socialis Bak. in Saund., Ref. Bot. **3:** t.180 (1870). *Type:* Natal, *Cooper* 3635 (K, holo.; PRE, photo.!).
Scilla paucifolia Bak. in Saund., Ref. Bot. **3:** t.181 (1870). *Type:* Saund., Ref. Bot. **3:** t.181, "Cape, *Cooper* s.n.", (1870).
Scilla violacea Hutch. in Kew Bull. **1932:** 511 (1932). *Type:* Cape, "Uitenhage Division", Klein River near Hankey, *Hutchinson* & *Long* s.n. (K, holo., PRE, photo.!; BOL!; PRE!).

Bulbs about 15—20 mm long, developed above the ground and usually producing colonies vegetatively. *Leaves* 2—3 [–5], 50—100 mm long, 10—15 mm broad, spreading to erect-spreading, lanceolate to oblong-lanceolate, sometimes with a petiole-like base to the lamina, somewhat fleshy, often deep pink or violet below and with a silvery sheen on the upper surface. *Inflorescence* more or less erect, often with fewer than 25 flowers.

Frequent in the eastern Cape between Uitenhage and East London, often on rather dry slopes, and possibly extending as far as Swaziland, but records are inadequate.

The epigeal bulb and somewhat spreading leaves distinguish this species from the smaller members of the *L. cooperi* complex. It also has affinities with *L. concolor*, which is a species of larger specimens often with undulate leaves and usually uniformally green leaves. (See Flower. Pl. S. Afr. **21:** t.825; 1941.)

The typification of this species presents a problem. Baker cited "Cape of

Good Hope, discovered by Mr. Cooper", but the locality given on the specimen, labelled "Drimia socialis, from the type plant", in Kew Herbarium, is Natal. Whether this specimen was incorrectly labelled or whether it is a valid record from Natal, where it is otherwise unrecorded, cannot be determined at the present time. This specimen does conform with both Saunder's figure and with the present author's concept of *L. socialis*.

The specimen labelled as the type of *S. paucifolia* (K, PRE, photo.!) does not match the Saunder's figure in bulb, leaf or inflorescence characters and is therefore not recognised as the type here.

Selected specimens:

Cape—3326 (Grahamstown): Frasers Camp, *Barker 6986* (NBG); Hopewell, *Acocks 12072* (PRE); 3327 (Peddie): Wooldridge, *Bayliss BS/3224* (RUH).

5. **Ledebouria concolor** (Bak.) Jess., comb. nov.

Drimia cooperi Bak. in Saund., Ref. Bot. **1:** t.18 (1868), non *Scilla cooperi* Hook. f., 1866. *Type:* Cape of Good Hope, *Cooper* s.n. (K, holo.; PRE, photo.!).

Scilla concolor Bak. in Saund., Ref. Bot. **3,** app.: 13 (1870). *Type:* as for *Drimia cooperi*.

Bulbs 30—50 mm long, epigeal and usually reproducing vegetatively to form colonies. *Leaves* 2—6, erect to erect-spreading, 50—150 mm long, 15—50 mm broad, broadly lanceolate to oblong-lanceolate, usually with undulate margins, never attenuate. *Inflorescence* more or less erect, not usually with more than about 100 flowers. *Flowers* usually (?always) green.

This species occurs only in the Port Elizabeth—Uitenhage areas of the eastern Cape. Its habit is rather like a large form of *L. socialis*, but with undulate leaves, lacking the silvery markings and probably also the pink on the lower leaf surfaces usually present in *L. socialis*. The leaves are probably never spotted with either pink or with different shades of green.

Drimia nitida Eckl. in S. Afr. Quart. J., no. **1:** 364 (1830) appears to be synonymous with *L. concolor*, but as no type material has been seen it has been preferred to the use of the latter name. *D. nitida* was reported to have been collected at Addo, eastern Cape.

Selected specimens:

Cape—3325 (Port Elizabeth): Addo Bush, *Long* 240, 241 (GRA); Glenconnor, *Long* 1320 (PRE).

6. **Ledebouria apertiflora** (Bak.) Jess., comb. nov.

Drimia apertiflora Bak. in Saund., Ref. Bot. **1:** t.19 (1868). *Type:* Saund., Ref. Bot. **1:** t.19, "Cape, *Cooper* s.n.", (1868).

Scilla lorata Bak. in Saund., Ref. Bot. **3**, app.: 14 (1870), nom. superfl., *type* as for *Drimia apertiflora.*
Scilla apertiflora (Bak.) C. A. Sm. in Kew Bull. **1930:** 250 (1930).
Scilla linearifolia Bak. in Saund., Ref. Bot. **3:** t.184 (1870). *Type:* Saund., Ref. Bot. **3:** t.184, "Cape, *Cooper* s.n.", (1870).

Bulbs 40—60 mm long, often pink towards the top. *Leaves* 4—7, erect, usually 200—350 mm long, and less than 25 mm broad, sublinear, tapering almost from the base. *Inflorescence* erect or flexuose, often with 50—150 flowers.

Although both types cited above originated in the Cape, the species as defined here appears to be largely restricted to Natal and the eastern Transvaal in South African herbaria. *Strey* 4487 (NH) from "Bizaia, Bizana Distr.", may belong here but lacks a bulb. This throws some suspicion on the validity of this concept of *L. apertiflora*, but in taking this view the present author is not only expressing his own opinion, but also upholding that of Van der Merwe. *Wood* 1208 (NH), from Inanda, Natal, was selected by Van der Merwe as a good match of the type of *S. linearifolia* (MS in PRE). This view appears to be well-founded. Although it is felt that it is justified to place *S. linearifolia* and *S. lorata* (both sensu Baker, 1896) in a single species, the breadth of leaf mentioned in Baker's type description of *Drimia apertiflora* is exceptionally great for the species as construed here. In other ways, too, this may be shown to be an unsatisfactory grouping of the material. *L. apertiflora* shows similarities with *L. cooperi* (cooperi series) from which it may be separated by having a larger bulb and more attenuate and perhaps firmer leaves. In the Transvaal it may also be confused with long-leafed forms of *L. undulata*. The bulb is never produced into a neck, and the leaves are longer. The low-veld forms and some Natal plants of *L. revoluta*, as defined in this review, also approach this species, but have broader leaves.

Selected specimens:
TRANSVAAL—2531 (Komatipoort): Malelane, *Lang* s.n. sub Tvl Mus. *30410* (PRE).
NATAL—2732 (Ubombo): Josini Dam, *Moll & Strey 3649* (NH, PRE); 2930 (Pietermaritzburg): 10 miles north of Greytown, *Mogg* s.n. (PRE).

7. **Ledebouria revoluta** (L.f.) Jess., comb. nov.
Hyacinthus revolutus L.f., Suppl.: 204 (1781). *Type:* "Cap. bonae spei", *Thunberg* s.n. (UPS, holo.; BOL & PRE on Herb. Thunb. Microfiche no. 8508!).
Phalangium revolutum (L.f.) Pers., Syn. Pl. **1:** 367 (1805).
Drimia (*?*)*revoluta* (L.f.) Kunth, Enum. Pl. **4:** 341 (1843).
Xeodolon revolutum (L.f.) Salisb., Gen. Pl.: 18 (1866).

Scilla revoluta (L.f.) Bak. in Saund., Ref. Bot. 3, app.: 6 (1870).
Lachenalia lanceaefolia Jacq., Icones **2:** t.402 (1794). *Type:* Jacq., Icones **2:** t.402 (1794).
Drimia lanceaefolia (Jacq.) Ker-Gawl. in Curtis's bot. Mag. **33:** t.1380 (1811).
Sugillaria lanceaefolia (Jacq.) Salisb., Gen. Pl.: 18 (1866).
Scilla lanceaefolia (Jacq.) Bak. in Saund., Ref. Bot. **3:** t.182 (1870).
Lachenalia maculata Tratt., Archiv. der Gewächskunde **2:** t.168 (1814). *Type:* Tratt, Archiv. der Gewächskunde **2:** t.168 (1814).
Scilla maculata Shrank, Pl. Rar. Hort. Acad. **2:** fol. 100, t.100 (1820). *Type:* Shrank, Pl. Rar. Hort. Acad. **2:** fol. 100, t.100, "Promontorium Bonae Spei", (1820).
Drimia acuminata Lodd., Bot. Cab.: t.1041 (1825). *Type:* Lodd., Bot. Cab.: t.1041, "Cape of Good Hope", (1825).
Scilla asperifolia Van der Merwe in Flower. Pl. S. Afr. **24:** t.944 (1944). *Type:* Natal, Ladysmith, *Van der Merwe* 2604 (PRE, holo.!; NU!).
Scilla carnosula Van der Merwe in Flower. Pl. S. Afr. **24:** t.958 (1944). *Type:* Natal, Greytown, *Van der Merwe* 2592 (PRE, holo.!).
Scilla albomarginata Van der Merwe in Flower. Pl. S. Afr. **24:** t.947 (1944). *Type:* Natal, near Umzinto, *Van der Merwe* 2669 (PRE, holo.!).

Bulbs 25—75 mm long; the outer scales often dark and glossy or with pink, often in the form of speckling, especially in the upper parts. *Leaves* 4—8, appressed to the ground, spreading or suberect, often not developing very far before flowering, but rarely over 150 mm long, up to 30 mm broad, ovate to lanceolate, usually attenuate; linear to linear-lanceolate in the early stages of leaf growth. *Inflorescence* suberect or suberect in the distal half and spreading in the lower half, usually with fewer than 100 flowers.

Occurs generally from Greyton (3419B; Caledon) through the belt between the karoo and the sea into Natal and the Transvaal, but rare west of Port Elizabeth. Also recorded from S.W.A. and the O.F.S.

In the south-west of its range it is a relatively small plant with a more or less erect inflorescence (Flower. Pl. S. Afr. **23:** t.913; 1943). *Muir* 1877 (BOL) from Riversdale is a very close match with the type of *Hyacinthus revolutus.* In much of the eastern Cape (e.g. *Dyer* 1142; GRA) the fully-developed outer leaves are firmly appressed to the ground, and the inflorescence is suberect. In the Transvaal highveld the leaves are erect-spreading, the bulb relatively large and the inflorescence flexuose. As the orientation of the leaves is strongly affected by the density of the surrounding vegetation, this does not appear to offer a satisfactory character for subdividing the *L. revoluta* complex.

Many specimens, especially from the lowveld, for example *Ward* 3288 (NH) from the Hluhluwe Game Reserve in Natal, have well-developed leaves at anthesis. It has also not been found possible to separate this form taxonomically. Similarily, the gradation in the size and form of other organs makes it difficult to find any other suitable character for subdividing this complex.

The only other species with leaves appressed to the ground is *L. ovatifolia* which has a different type of bulb and usually broader, less attenuate leaves. Specimens linking this complex with the *L. cooperi* complex occur over much of its range (e.g. *Van der Merwe* 1554 (PRE) from near Leslie in the Bethal district). Other specimens exist which are intermediate between *L. revoluta* and *L. floribunda* (e.g. *Young* A365 (PRE) from Schoeman's Kloof in the Belfast district).

The leaves of the type of *S. albomarginata* are more like those of *L. ovatifolia*, but the bulb places it rather in *L. revoluta*.

Selected specimens:

S.W.A.—1920 (Tsumkwe): Nama Pan, *Story 5181* (PRE).
TRANSVAAL—2630 (Carolina): Carolina, Witkloof, *Van der Merwe* Sc3 (PRE).
CAPE—3326 (Grahamstown): Penrock Farm, 8 miles from Grahamstown, *Dyer 1142* (GRA); 3421 (Riversdale): Melkhoutfontein, *Muir 1877* (BOL).

8. **Ledebouria inquinata** (C. A. Sm.) Jess., comb. nov.
Scilla inquinata C. A. Sm. in Kew Bull. 1930: 248 (1930). *Type:* Transvaal, near Pretoria along the Aapies River, *Burke* s.n. (K, holo.; PRE, photo.!).

Bulbs 25—65 mm long, the outer scales often dark and glossy or with a pink tinge especially in the upper parts. *Leaves* erect, ovate-lanceolate narrowing towards the base, up to 150 mm long, 35 mm broad, very glaucous and usually not conspicuously spotted, often poorly developed at flowering. *Inflorescence* flexuose to suberect, with 50—150 flowers.

Wide-spread in the Transvaal but apparently rare in the lowveld and not collected in the other provinces.

The bulb is similar to that of *L. revoluta* and *L. marginata* but the pink colour tends to be present as a uniform wash rather than as spots and the bulbs divide to form two cohering daughter bulbs more frequently than in the other two species. The erect very glaucous leaves, which usually lack spots are also characteristic. At flowering the attenuate apices of the leaves are often all that show of the leaf, but the narrowing of the leaf towards the base contrasts with the broader base of the other two species. Nevertheless it is not always possible to distinguish *L. inquinata* and *L. revoluta* and it is considered possible that with further data it may be decided not to uphold *L. inquinata*.

Selected specimens:

TRANSVAAL—2427 (Thabazimbi): Road from Rooiberg to Warmbaths, *Van der Merwe 1965* (PRE); 2528 (Pretoria): Pienaars Poort, *Leeman* s.n. sub PRE *30529* (PRE); Premier Mine, *Rogers 9825A* (Z).

9. **Ledebouria undulata** (Jacq.) Jess., comb. nov.

Drimia undulata Jacq., Icones **2:** t.376 (1794). *Type:* Jacq., Icones **2:** t.376 (1794).

Scilla undulata (Jacq.) Bak. in Saund., Ref. Bot. **3,** app.: 11 (1870); nom. illegit., non *S. undulata* Desf., 1798.

Scilla undulatifolia Von Poelln. in Ber. dt. bot. Ges. **41:** 209 (1944). *Type:* as for *Drimia undulata* Jacq.

Drimia ensifolia Eckl. in S. Afr. Quart. J. **1:** 364 (1830). *Type:* Cape, Zwartkops, "Uitenhage", *Zeyher* 10 (K, lecto.; PRE, photo.!).

Scilla ensifolia (Eckl.) Britten in J. Bot., Lond. **46:** 201 (1908).

Scilla prasina Bak. in Saund., Ref. Bot. **3,** app.: 10 (1870). *Type:* "Kaffirland", *Gill* s.n. (K, holo.; PRE, photo.!).

?Scilla laxiflora Bak. in Gdnrs' Chron. **9:** 668 (1891). *Type:* ?"Hort. N. E. Brown" (K, ?holo.; BOL, drawing!).

Scilla ecklonii Bak. in Bot. Jb. **15,** Beibl. 35: 7 (1892). *Type:* Cape, *Ecklon & Zeyher* Asphod. n. 12 (B, holo.!).

Scilla nelsonii Bak. in Fl. Cap. **6:** 488 (1896). *Type:* South Africa, without locality, *Burke* s.n. (K; PRE, photo.!); Vaal River, *Nelson* 167 (K; PRE, photo.!; PRE!—the specimen in PRE lacks a bulb but may be nearer *L. cooperi*).

Scilla rautanenii Schinz in Bull. Herb. Boissier **5:** 857 (1897). *Type:* Kaokoveld, *Rautanen* 172 (Z, holo.!).

Drimiopsis engleri Krause in Bot. Jb. **51:** 445 (1914). *Type:* S.W.A., "Narib: am Fuss der Kalaharihügel, *Engler* 6534 (B, holo.!).

Bulbs 20—50 mm long, often either with numerous dry outer scales and abruptly truncate at the apex or produced into a neck which may be as long as or longer than the bulb; the roots sometimes in the form of narrow, elongate fusiform tubers (see Flower. Pl. S. Afr. **21:** t.826; 1941). *Leaves* 2—6, narrowly linear-lanceolate to lanceolate, more or less erect to spreading, rather firm, sometimes distichous, often folding longitudinally, usually 50—150 mm long, rarely over 20 mm broad. *Inflorescence* erect.

A species-complex of the dry parts of South Africa and South West Africa, occurring from the southern Cape to the Transvaal.

Small forms can be confused with the *L. cooperi* complex (e.g. *Wylie* s.n. sub Tvl. Mus. 34294 (PRE) from Greytown, Natal), but the several dry outer bulb scales, especially when these form a neck, the relatively firm leaves and bicoloured or greenish flowers assist in distinguishing them.

The type of *Scilla prasina* is considered by the present author to belong to this species despite having exceptionally broad leaves.

There isn't absolute certainty that the specimen cited as the type of *S. laxiflora* is in fact the type. But it agrees with the description and both specimen and description belong within this concept of *L. undulata.*

When difficulty is experienced in separating *L. undulata* from *L. revoluta* (e.g. *Acocks* 16315 (PRE) from Dwaal Station in the Hanover district), a pedicel length below 5 mm can be regarded as an indication of *L. undulata.* Other specimens, for example *Strey* 3475 (PRE) from Mopane in the Soutpansberg district, show affinities with *L. apertiflora.*

Selected specimens:

S.W.A.—2718 (Grunau): Naruda Süd, *Pearson* s.n. sub P. Sladen Expedition of 1912–13 no. *7990* (BOL).
O.F.S.—2925 (Jagersfontein): Fauresmith, Groenvlei, *Henrici 3802* (PRE).
CAPE—3318 (Cape Town): Hopefield, *Bolus 12891* (BOL); 3325 (Somerset East): Boschberg, *MacOwan 1842* (GRA).

10. **Ledebouria graminifolia** (Bak.) Jess., comb. nov.

Scilla graminifolia Bak. in Bull. Herb. Boissier, ser. 2, **4:** 1001 (1904). *Type:* Transvaal, Modderfontein, *Conrath* 703 (K, holo.; PRE, photo.!; BOL, drawing!; GRAZ; Z!).

Scilla stenophylla Van der Merwe in Flower. Pl. S. Afr. **25:** t.959 (1944). *Type:* Natal, Paulpietersburg, *Van der Merwe* 2655 (PRE, holo.!).

Bulbs 30—50 mm long. *Leaves* 10—20, linear, 40—80 mm long, 1—4 mm broad, usually spirally twisted. *Inflorescence* suberect, rather dense, often with about 30—70 flowers.

Occurs mainly in the Transvaal, where it is wide-spread, and recorded from northern Natal.

In many respects *L. graminifolia* is intermediate between the minima series of *L. cooperi* and *L. undulata.* The bulbs are intermediate in size, but the length, shape and spiral twisting of the leaves are diagnostic. The twisting is, however, not always apparent, particularly at flowering, when the leaves may be poorly developed. The bicoloured flowers and large number of leaves further serve to distinguish it from *L. cooperi.* Like *L. undulata* the bulb may be extended to form a sheath at the base of the lamina of the leaves. It may not be possible to distinguish this species from *L. marginata* before the leaves are well-formed, but the broader leaf with several raised veins characterises *L. marginata* later in growth.

In some specimens with leaves of the form characteristic of *L. graminifolia* the bulb scales may produce copious threads when torn as in *L. ovatifolia* and *L. luteola.* But such specimens are probably best placed in *L. luteola* (e.g.

Smith 8602B (PRE) from Vaalbank in the Bloemfontein district). It does seem possible that *L. graminifolia* and *L. luteola* hybridise. Both occur at Modderfontein and the sheet of *Conrath* 703 in Zurich shows a typical plant of *L. graminifolia* (left-hand specimen on sheet) and of a specimen intermediate between these species but probably closer to *L. luteola*.

Selected specimens:

TRANSVAAL—2628 (Johannesburg): Modderfontein, *Van der Merwe 1986* (PRE); 2730 (Vryheid): between Wittenberg and Bergen, *Acocks 11735* (BOL, NH, PRE).

11. **Ledebouria marginata** (Bak.) Jess., comb. nov.
Scilla marginata Bak. in Bull. Herb. Boissier, ser. 2, **4:** 1002 (1904). *Type:* Transvaal, Modderfontein, *Conrath* 703b (GRAZ, lecto.; PRE, photo.!; Z!).
Scilla neglecta Van der Merwe in Flower. Pl. S. Afr. **22:** t.865 (1942). *Type:* Transvaal, Pretoria, Colbyn, *Van der Merwe* 2441 (PRE, holo.!).

Bulbs 40—80 mm long; the outer scales often dark and glossy with pink markings. *Leaves* 4—10 [-16], erect, firm, with prominent veins, up to 160 mm or rarely more long, 10—30 mm broad. *Inflorescence* usually flexuose, with 50—150 flowers.

Occurs from the eastern Cape (Aliwal North and Queenstown) through the O.F.S., Natal and Lesotho and over most of the Transvaal except, perhaps, the lowveld. The bulb is very similar to that of forms of *L. revoluta* from the Transvaal, but the leaves are more attenuate and much firmer—retaining their shape so that, after growth has commenced in spring, the previous season's dead leaves often persist. They are similar in texture to the leaves of *Scilla nervosa*, but the rigidity is given by collenchyma not sclerenchyma as in *S. nervosus*.

Selected specimens:

TRANSVAAL—2428 (Nylstroom): 5 miles east of Warmbaths, *Collett s.n.* (PRE).
O.F.S.—2824 (Kimberley): 14 miles north-east of Kimberley, *Leistner 2875* (PRE).
LESOTHO—2927 (Maseru): Roma, *Schmitz 30* (PRE).
CAPE—3026 (Aliwal North): Aliwal North, *Gerstner 67* (PRE).

12. **Ledebouria luteola** Jess., sp. nov., *L. marginatae* (Bak.) Jess. affinis, sed minor, bulbo luteolo et squamis bulbi ubi laceratis fila plurima exhibentibus.

Bulbi squamis exterioribus brunneis, sed squamis interioribus luteolis, 35—40 mm longi; squamae ubi laceratae fila plurima exhibentes. Folia 6—10, erecta, angusto-lanceolata, 45—90 mm longa, viridia, fasciis indistinctis transversis. Inflorescentiae 1 vel 2, suberectae, 80—90 mm longae, compactae. Pedicelli c. 30—50, patentes, reflectescentes. Perianthii segmenta suberecta, c. 4 mm longa, longitudine fasciata.

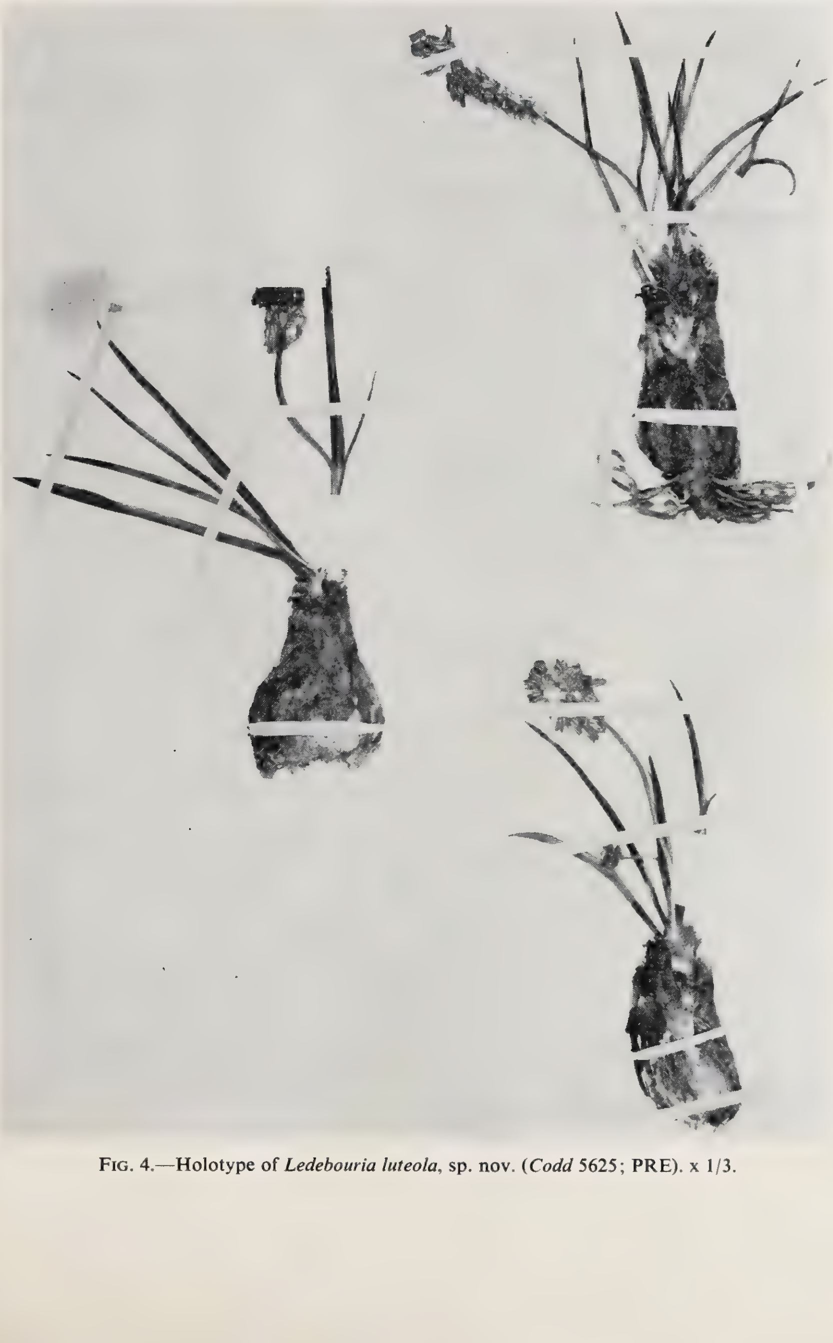

FIG. 4.—Holotype of *Ledebouria luteola*, sp. nov. (*Codd* 5625; PRE). x 1/3.

Type: Transvaal; Pretoria (2528), 6½ miles south of Hammanskraal, *Codd* 5625 (PRE, holo.).

Bulbs 35—50 mm long; the scales producing copious threads when torn; the inner scales yellow. *Leaves* 4—10, erect or arcuate, up to 80 [–130] mm long, lanceolate to linear-lanceolate, spotted or transversely marked, rather firm. *Inflorescence* more or less erect, with 30—60 flowers.

Occurs widely in the Transvaal, northern O.F.S. and north-western Natal, particularly in dampish areas.

Small forms (e.g. *Van der Merwe* 1289 (PRE) from Pilgrim's Rest) are not readily distinguishable from the form of *L. cooperi* described by Van der Merwe under the epithet *rupestris*.

Narrow-leafed forms may be difficult to separate from *L. graminifolia* but the bulb is apparently diagnostic. There are also specimens linking it with *L. marginata* (e.g. *Conrath* 696 (Z) from Modderfontein, near Johannesburg).

Selected specimens:

TRANSVAAL—2330 (Tzaneen): Tzaneen, *Van der Merwe 1177* (PRE);
2527 (Rustenburg): 22 miles west of Rustenburg, *Van der Merwe 1127* (PRE);
2530 (Lydenburg): Belfast, *Van der Merwe 1832* (PRE).

13. **Ledebouria ovatifolia** (Bak.) Jess., comb. nov.

Scilla ovatifolia Bak. in Saund., Ref. Bot. **3:** t.183 (1870). *Type:* Natal, *Cooper* s.n. (K, holo.; PRE, photo.!).

Scilla lanceaefolia sensu Wood, Natal Pl. **3** (4): t.202 (1900), non *Lachenalia lanceaefolia* Jacq.

Scilla climacocarpha C. A. Sm. in Kew. Bull. **1930:** 249 (1930). *Type:* O.F.S., near Bethlehem in a damp shady ravine, *Phillips* 3068 (PRE!).

Scilla guttata C. A. Sm. in Kew. Bull. **1930:** 243 (1930). *Type:* Natal, "Durban Div.", *Cooper* s.n. (K, holo.).

Scilla cicatricosa C. A. Sm. in Kew. Bull. **1930:** 246 (1930). *Type: Wood*, Natal Pl. **3** (4): t.202 (1900).

Scilla elevans Van der Merwe in Flower. Pl. S. Afr. **24:** t.948 (1944). *Type:* Natal, Vryheid, *Van der Merwe* 2677 (PRE!).

Scilla collina Hutch., Bot. in S. Afr.: 344 (1946). *Type:* Transvaal, Soutpansberg, Klein Australe, *Smuts & Gillett* 4186 (K, holo.; PRE, photo.!).

Bulbs [30–] 40 [–150] mm long; membranous outer scales lacking or very insignificant; the scales rather truncate and vertically imbricate; the outermost very short and only the innermost reaching the top of the bulb; all producing copious threads when torn. *Leaves* 2—5, usually firmly appressed to the ground, up to 250 mm long, ovate, with a broad base. *Inflorescence* usually flexuose, with about 50—150 densely packed flowers.

Occurs, perhaps as far west as Grahamstown in the eastern Cape, through Natal, Lesotho and into most of the Transvaal. There are a few records from the O.F.S.

The bulb characters, described above, do not occur in any other species of *Ledebouria* in South Africa. Only in *L. luteola* are threads apparently produced in such large quantities. These threads have been described as removable spiral thickenings of the xylem conducting elements (Badenhuizen, 1954, in *Protoplasma* **43** (4): 429–440).

In his description of *S. elevans*, *Van der Merwe* stated that his new species only differed from *S. ovatifolia* in having erect leaves, "which do also sometimes occur in that species as well". This difference in leaf position is almost certainly sometimes produced by genetic factors. But it does not, in the opinion of the present author, constitute a satisfactory character on which to subdivide the complex, particularly as in many cases the same effect may be produced entirely by environmental factors.

In shady places, especially plantations, the leaves may be suberect and linear-lanceolate, making them indistinguishable from those of the larger forms of *L. cooperi*.

See Flower. Pl. S. Afr. **21:** t.830 (1941) for an illustration of the commonest form.

Selected specimens:

TRANSVAAL—2528 (Pretoria): Fountains Valley, *Van der Merwe 2001* (PRE).
NATAL—2931 (Stanger): Claremont, *Schlechter 2940* (unusually small form) (BOL, GRA).
CAPE—3029 (Kokstad): Kokstad, *Tyson 1123* (BOL, SAM).

14. **Ledebouria hypoxidioides** (Schonl.) Jess., comb. nov.

Scilla hypoxidioides Schonl. in Rec. Albany Mus. **1:** 48 (1903). *Type:* Cape, Grahamstown, behind Fort England, *Daly & Sole* 435 (GRA, holo.!; BOL!; SAM!; Z!).

Bulbs 25—40 mm long, sometimes produced into a short neck, sometimes pink towards the top. *Leaves* 2—4, 60—150 mm long, 15—35 mm broad, suberect, ovate-oblong to oblong-lanceolate, moderately firm, densely silky white pubescent on both surfaces. *Inflorescence* more or less erect, often with about 75—150 flowers.

This species has only been recorded in the immediate vicinity of Grahamstown. The hairy leaves render it unmistakable, as there is no other known pubescent species of *Ledebouria*. Schonland (1903) states: "It grows amongst grass and also in rocky situations at an altitude of about 1,700 to 2,300 feet. Its silky haired leaves resemble those of some species of *Hypoxis* . . ."

Selected specimens:
Cape—3326 (Grahamstown): Hills above Grahamstown, *Van der Merwe 2138* (PRE).

15. **Ledebouria viscosa** Jess., sp. nov. affinitate non manifesta. A speciebus omnibus *Ledebouriae* foliis viscidis differt.

Bulbi axibus basaliter elongatis, 50—55 mm longi, 12—15 mm lati. Folia ?1—3, erecta, oblanceolata-spathulata, 100—140 mm longa, 20—30 mm lata, viscida. Inflorescentiae erectae, solitariae, 150—170 mm longae. Pedicelli 20—30, patentes, c. 8 mm longi. Perianthii segmenta suberecta, c. 5 mm longa.
Type: Transvaal; Thabazimbi (2427), Kransberg, *Meeuse* 10493 (PRE, holo.).

Bulbs 50—100 mm long, 12—20 mm broad, with the axis greatly extended below the succulent parts of the leaf bases (see plate 2). *Leaves* 1—3, erect, oblanceolate-spathulate, 90—230 mm long, 17—30 mm broad, viscid. *Inflorescence* erect with about 20—30 rather widely spaced flowers.

Only recorded from the type area. It differs from all other known species of *Ledebouria* in having viscid leaves and in the shape of both the leaves and the bulbs. Its affinities are obscure. Although other collectors have recorded the viscid nature of the leaves and although the leaves of both herbarium specimens and specimens examined in the field by the author have large numbers of sand particles adhering, it was found that the leaves are not actually sticky to the touch. Whether the stickiness is a feature of the leaves only at certain times of the year or at certain stages of development has not been ascertained. It was also noticed that certain other plants, especially a species of grass, also had sand adhering to the leaves, introducing the possibility that it is a characteristic of the sand rather than of the *Ledebouria*. It grows on loose red sands.

Dyer & Ehrens 4201 (PRE) is interesting as it is in fruit; fruit not often having been collected in *Ledebouria*.

Selected specimens:
Transvaal—2427 (Thabazimbi): Farm Waterval on the western side of the Kransberg in sandy soil in the open, *Dyer & Ehrens 4201* (PRE).

Nomina dubia

Drimia ludwigii Miquel in Bull. Scien. Phys. Neerl. 1839: 39—40 (1839). No type cited and description inadequate.

Skilla filiformis Rafin., Autikon Botanikon: 56 (1840). No type cited and description inadequate.

Drimia angustifolia Kunth, Enum. Pl. **4:** 340 (1843). *Type: Drège* 8618b. Not traced and description inadequate.

Drimia dregeana Kunth, Enum. Pl. **4:** 340 (1843). *Type:* Cape, *Drège* 1616c. Not traced and description inadequate.

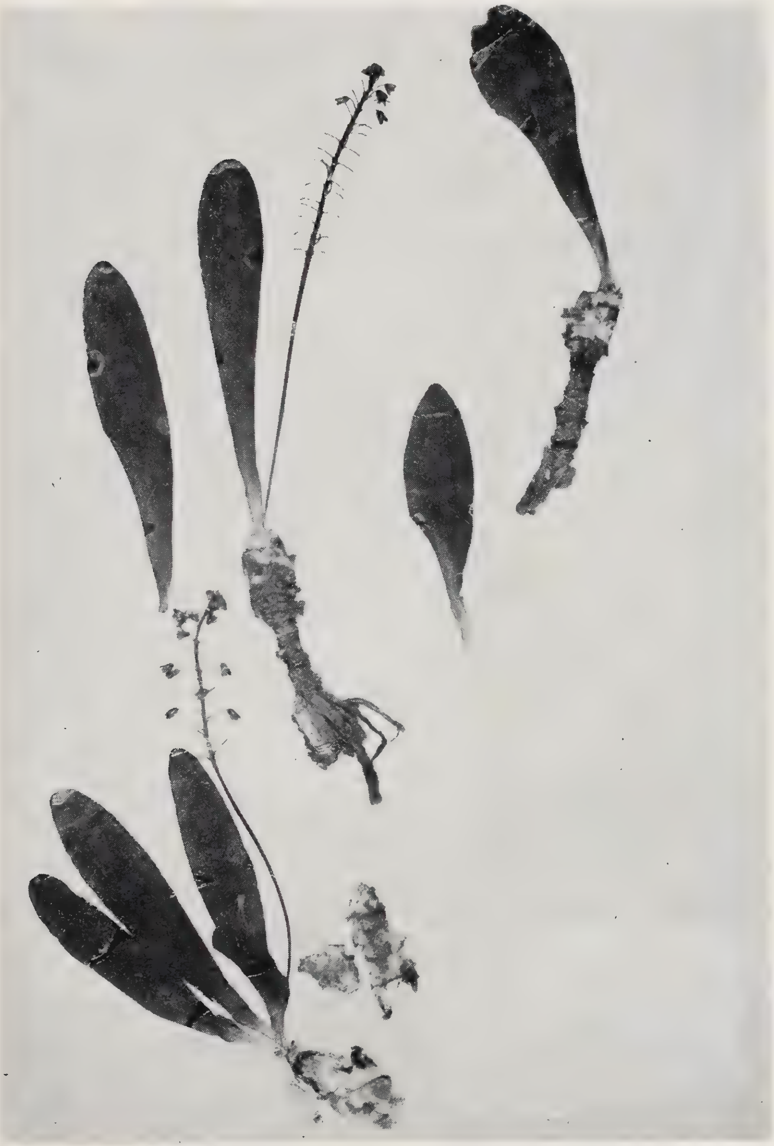

FIG. 5.—Holotype of *Ledebouria viscosa*, sp. nov. (*Meeuse* 10493; PRE). x 1/3.

Idothea (*?*)*ludwigii* (Miquel) Kunth, Enum. Pl. **4:** 681 (1843).

Drimia viridiflora Eckl., Topogr. Verzeichn. der Pflanzensammlung van Chr. Fr. Ecklon (1827). *Type: Zeyher* s.n., Oct. 1825. This specimen has not been located and there is no description.

Drimia viridiflora Kunze in Linnaea **20:** 10 (1847). Described from a bulb sent from the Cape by Gueinzius; but with the following note: "Speciem esse Ecklonianum e solo nomine suspicor; nam specimina nondum vidi." This specimen has also not been located, nor is his plant identifiable from his description.

Scilla exigua Bak. in J. Linn. Soc. (Bot.) **13:** 247 (1873). *Type:* Natal, Camperdown, Assegai Kraal, *Sanderson* 670. Not located and description inadequate.

Scilla ludwigii (Miquel) Bak. in Saund. Ref. Bot. **3,** app.: 9 (1870).

Scilla barberi Bak. in J. Linn. Soc. (Bot.) **13:** 247 (1873). *Type:* Cape, "ad ripas fluminosis Tsomo", *Barber* 805. Not located and description inadequate.

Scilla viridiflora (Kunze) Bak. in J. Linn. Soc. (Bot.) **13:** 255 (1873).

Scilla ondongensis Schinz in Vierteljahrsschr. Nat. Ges. Zurich **42:** 535 (1912). *Type:* Ovamboland, Ondonga, *Alma Kestila* 36a. Not located and description inadequate.

Scilla kestilana Schinz in Vierteljahrsschri. Nat. Ges. Zurich **42:** 535 (1912). *Type:* Ovamboland, Ondonga, *Alma Kestila* 36b. Not located and description inadequate.

Scilla xanthobotrya Von Poelln. in Portug. Acta Biol., ser B., **1:** 213 (1944). *Type:* Transvaal, "Waterfall River bei der Stadt Lydenburg", *Wilms* 1518. Not located and description inadequate.

Nomina exclusa

Hyacinthus flexuosus Thunb., Prodr. Fl. Cap.: 64 (1794). *Type:* South Africa, *Thunberg* s.n. Specimen in the Thunberg Herbarium in Uppsala is not a *Scilla* or *Ledebouria;* possibly a species of *Ornithogalum.*

Scilla flexuosa (Thunb.) Bak. in J. Linn. Soc. (Bot.) **13:** 245 (1873).

Scilla pearsonii Glover in Ann. Bolus Herb. **1:** 105 (1915). *Type:* Central Karasberg, Scharfenstein, P. S. Ex. 1912/13 7989 (BOL, holo.; PRE, photo.!). =*Lachenalia pearsonii* (Glover) Barker in Jl. S. Afr. Bot. **35:** 321 (1969).

Scilla baumiana Engl. & Gilg. in Warb., Kunene-Samb.-Exped.: 195 (1903). *Type:* "An der Chitandamindung . . .", *Baum* 122 (Z!). =*Urginea* sp.

An index to binomials will be prepared for inclusion after the second part of this series.